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Theory and Research in Education

The philosophy of personal epistemology

Katariina Holma

University of Eastern Finland, Finland

Heidi Hyytinen

University of Helsinki, Finland

Abstract

In higher education, *personal epistemology* is today a significant research area. PE has been seen as promising particularly because it focuses on one of the general learning aims of many contemporary universities, namely, the development of students' creative and critical thinking. The article identifies serious conceptual problems in the theoretical framework of PE. Firstly, we argue — contrary to many promoters of PE — that PE's theoretical models are not based merely on empirical data from developmental psychology, but clearly feature normative philosophical elements. Secondly, we consider the acceptance of relativism in the theoretical framework of PE. We argue that the concept of fallibilism has been overlooked, which has forced PE theorists to choose between naïve realism and relativism. Their choice of relativism has led — in addition to other philosophical problems — to a loss of adequate definitions for the epistemological notions of objectivity and certainty. The recognition of epistemological fallibilism would be beneficial both to PE's theoretical framework and to PE-based university pedagogy.

Keywords

Personal epistemology, epistemology, relativism, fallibilism, empirical, philosophical

Introduction

Personal epistemology (PE) is today a significant field in higher education research. PE examines students' conceptions of knowledge¹ from the perspective of developmental psychology. PE has been seen as a promising research area particularly for two reasons: firstly, it focuses on one of the general learning aims of many contemporary universities, namely, the development of students' creative and critical thinking (Fisher, 2011; Bok, 2006; Hofer, 2005), which the literature on PE sees as fundamentally connected to students' conceptions of knowledge (Hofer, 2001, 2005; Hofer and Bendixen, 2012; Kember, 2001; King and Kitchener, 1994, 2004; Lucas and Tan, 2013; Nieminen et al., 2004; Phan, 2008). Secondly, PE researchers have provided pedagogical recommendations based on their research results (Brownlee, 2004; Hofer, 2001, 2006a; Hofer and Pintrich, 2002; Muis et al., 2006; Perry, 1970; Schommer-Aikins and Easter, 2006), and have thus fulfilled the current demand to link research and teaching in higher education institutions (Brew, 2003; Brew and Jewell, 2012; Healey, 2005).

According to Pintrich's widely used definition, PE refers to 'an individual's cognitions about the nature of knowledge and the nature of knowing' (Pintrich 2002: 390). PE's research tradition has drawn heavily from William Perry's pioneering work in the late 1950s, when Perry began to explore Harvard freshmen's intellectual and ethical development during their college years (see Perry, 1970; Moore, 2002). On the basis of his research, Perry constructed a model concerning the variety and progression of

students' epistemological and ethical thinking. In Perry's model, students' views of knowledge evolve from naive egocentrism, absolutism and dualism toward a relativist view of knowledge. According to Hofer and Pintrich's (1997; see also Pintrich, 2002) summary of the contemporary research findings and theoretical models of PE, the following four aspects are crucial: (1) the certainty of knowledge (an absolutist versus a relativist view), (2) the simplicity of knowledge (simple and concrete versus complex and context-dependent), (3) the source of knowledge ('from external authorities' versus 'from personal construction') and (4) the justification for knowing (criteria for making knowledge claims, use of evidence and use of reasoning).

In this article we focus on the hierarchical models used in PE research and argue that they contain fundamental conceptual confusion. This confusion, in our view, is connected to a deeper problem: the theoretical framework of PE lacks the notion of epistemological fallibilism. Without fallibilism, PE scholars have made a choice between the epistemological positions of naïve realism and relativism. Their choice of relativism has led — in addition to other philosophical problems — to a loss of adequate definitions for the epistemological notions of objectivity and certainty.

Although our analysis focuses on one particular theory, our broader aim is to demonstrate the importance of philosophical analysis for educational theorizing more generally. As with PE, educational theories contain both empirical and philosophical research elements. The relationship between these two groups of elements cannot be adequately determined without cooperation between the two types of research. Therefore, we think that the arguments presented in this article in relation to PE also have wider relevance in educational research.

The philosophical elements of PE

Before we continue to our main argument concerning the philosophical difficulties in the hierarchical models² of PE, we must discuss one potential objection to our argument. Namely, many promoters of PE (e.g. Southerland et al., 2001; Kitchener, 2011) seem to think that their research approach is based merely on empirical psychological research and thus has nothing to do with philosophical conceptions of knowledge. As Southerland et al. (2001: 333) describe their approach: '[t]he key to understanding the psychological approach to the study of knowledge is that the scientists of human behaviour view knowledge and beliefs as *psychological constructs* (clearly within Popper's (1972) second world).' And as they elsewhere (2001: 331) describe their interpretation of 'Popper's second world': 'the *second* is the world of subjective, individual, mental operations (the life of the mind or private consciousness)'. Kitchener (2011: 89) makes a distinction between philosophical epistemology and personal epistemology when he states that philosophical '[e]pistemology is concerned with providing an account of the justification condition — of when a belief or action is justified (warranted, appropriate) — whereas PE is concerned with determining the actual beliefs held by subjects along (perhaps) with causal or genealogical conditions. Justification and related concepts are, at their core, normative concepts'. According to him (2011: 84), '[i]nsofar as PE research aims to be scientific — something most PE researchers would seem to want — it should be committed to the empirical testability of its claims. This motif of positivism (or better empiricism) is a legacy we should retain as an essential part of an adequate epistemology for PE research'. Later Kitchener (2011: 85) states that 'it [philosophical epistemology] could construct a completely philosophical theory of knowledge with no (or little) dependence on any scientific fact. It would follow therefore that a study of PE and the correlative concept of a PE would be different from this philosophical epistemology'.

However, some scholars in the tradition of PE seem to think differently, and have endeavoured to

analyse the relationship between psychological and philosophical epistemology in PE's theoretical constructions (e.g. Greene et al., 2008, 2010; Muis, 2004; Muis et al., 2006; Murphy, 2003; Murphy et al., 2012). Murphy et al. (2012) have recently argued that a deeper understanding of the nature and conditions of knowledge is needed in PE theory. Elsewhere, Buckland (2010) and Chinn et al. (2011) have pointed out that the prevailing research on PE insufficiently engages philosophy. We share this view that the philosophical analysis of PE is not yet sufficient: there are serious philosophical problems in the background assumptions of PE which may result in problematic educational guidelines and in a distortion of researchers' interpretations of empirical data.

We of course agree with Kitchener and many others that the philosophical and empirical analyses of knowledge differ fundamentally from each other; indeed, were it true that the theoretical models of PE would merely categorize and organize empirical data, the whole idea that PE is in need of further philosophical research would be pointless. Namely, the philosophical analysis of knowledge focuses on the adequate definition and justification of knowledge as a theoretical concept, whereas the empirical analysis of knowledge is interested in how human beings actually see and understand the nature of knowledge and how knowledge is constituted and acquired by human beings.³ The distinction between normativity (how things ought to be) and descriptivity (how things are) is important here. In the language of philosophy, one commits the *naturalist fallacy* if one deduces 'ought' from 'is' or vice versa. On the basis of a philosophical analysis, one cannot say how things are in the real world, and on the basis of an empirical analysis one cannot say how things ought to be. Therefore, when one is interested in understanding what the most adequate conception of knowledge is, one should consult philosophical research; conversely, when one is interested in what people actually think about knowledge and how they construct their systems of belief, one should consult empirical research.

It follows that on the basis of empirical research, one can derive no conclusions concerning the superiority of one conception of knowledge over another. To the extent that the theoretical models of PE do this, they involve a normative dimension. Furthermore, in not recognizing the normative nature of some parts of the theory — and in interpreting them as descriptive — they commit the naturalist fallacy. The following three examples demonstrate that PE's theoretical models include normative elements.

Firstly, PE's theoretical models entail claims of the superiority of some conceptions of knowledge over others. These models are clearly hierarchical, because they hold that some epistemological positions are more 'sophisticated' or 'higher' than others (Kaartinen-Koutaniemi and Lindblom-Ylänne, 2012: 2; King and Kitchener, 1994, 2004; Kuhn, 1999, 2005; Perry, 1970; West, 2004). In Paul Pintrich's (2002: 400) words: 'there is fairly high agreement on the nature of developmental change. Again, at some level, all the models represented in this volume are in line with the proposition that an individual's thinking about epistemological issues not only changes over time, but that it develops toward a more sophisticated perspective or stance toward knowledge and knowing'. This is to say that the theories maintain that there are differences in the adequacy and justifiability of students' personal conceptions of knowledge and that PE's hierarchical models manifest this order of superiority.

Secondly, PE researchers have provided multifarious educational recommendations based on their empirical findings (e.g. Brownlee et al., 2009; Hofer 2001, 2006b; Lahtinen and Pehkonen, 2013; Muis et al., 2006; Perry, 1970). As an example, Brownlee et al. (2009: 612) write: '[e]ssentially, we are advocating for pedagogy in higher education that is informed by personal epistemology rather than the implementation of particular teaching strategies per se. This new pedagogy requires a culture change in learning (Baxter Magolda and Terenzini, 2004); one that engages us all in a more sophisticated way of knowing and learning in higher education'.⁴

Thirdly, PE scholars appear to assume that change in students' conceptions of knowledge can be unproblematically interpreted as development from lower (less adequate) to higher (more adequate) conceptions.⁵ However, there is always the possibility of some kind of adaptation instead of genuine

development. It is possible, for example, that students have learned from their teachers what would be the most adequate way to think about knowledge, and have adopted this view regardless of its real epistemological benefits.⁶

These three examples demonstrate that there are normative elements in the theory of PE. This is not a problem as such, but rather a necessary characteristic of a model constructed in a research approach which aims to both gain knowledge from students' actual conceptions and provide pedagogical recommendations for developing these conceptions. However, the theoretical model constructed within a research field of this nature needs an understanding of students' actual conceptions as well as the normative standards of knowledge; otherwise it clearly commits the naturalist fallacy of deducing 'ought' from 'is'. In other words, this kind of theory including both descriptive and normative elements must consult both types of research, empirical and philosophical alike.

The distinction between descriptivity and normativity also implies that the present article as a philosophical analysis is not, in the first place, criticizing the empirical findings of PE. For example, on the basis of empirical research it can be true that students' conceptions of knowledge develop toward relativism. Our point is that even if this was empirically true, it would not imply that relativism is an epistemologically justified position. In addition, it is also possible that the theoretical models used in interpreting empirical data have distorted the research findings. Recent empirical findings actually indicate that empirical data cannot be properly interpreted using the current PE models, because these models do not capture the variation of students' epistemic positions (Hyytinen et al., 2014). For example, all students in the present small-scale qualitative study were found to share a fallibilist view of knowledge, whereas previous research on PE has not identified students who are committed to epistemological fallibilism. Indeed, this would have been difficult or even impossible because the concept of fallibilism is not included in the theoretical framework of PE.

In the following two sections we will first analyse in more detail the philosophical component of PE theory. We will argue that in its embrace of epistemological relativism and in its naïve interpretation of realism PE theory ends up in serious conceptual confusion. Second, we will suggest that fallibilism — the epistemological position missing from PE literature — would be useful in order to avoid the conceptual problems of the current theory.

PE's Untenable Normative Epistemology

The idea of relativism as a *sophisticated* – or in some versions the most developed — epistemological position that one can acquire is shared among PE's theoretical variants as well as among researchers' interpretations of empirical data (Briell et al., 2013; Hofer and Pintrich, 1997; Hofer, 2000, 2002, 2005, 2006b; Kember, 2001; Perry, 1970).

The pioneering theory endorsing relativism is from Perry (1970: 109–111), who describes a revolutionary step in students' thinking in which their worldview becomes entirely relativistic. Perry (1970: 111) describes this level of personal epistemology as follows:

Relativism is perceived as the common characteristic of *all* thought, *all* knowing, all of man's relation to his world. Against this ground, dualistic right-or-wrong thinking, and even “ideas of absolutes” becomes special cases *in the new relativistically structured context*.

Although the mainstream literature of PE endorses relativism, some scholars within the tradition have questioned the idea of relativism as a sophisticated view of knowledge (e.g. Schommer-Aikins, 2002; Kuhn, 2005; Kitchener, 2011). Perry's adherence to relativism, and its criticism, have been

discussed for example by Moore (2002). However, the various philosophical critiques of relativism and the positive solution of including fallibilism within the theoretical framework of PE — the main points of this article — have not been considered in any depth.

Furthermore, the discussion on the potential problems of relativism has had little effect on the endorsement of relativism in PE's pedagogical recommendations. In Hofer's (2006b: 74; see also 2001) words, 'based on Perry's developmental scheme, faculty members have been advised for several decades to help students move from their black-and-white thinking toward a more relativist stance'. Elsewhere, Hofer and Bendixen (2012: 246) write that '[b]eginning with Perry (1970), epistemology researchers have asserted that education should equip students to advance beyond absolutist thinking and learn to make reasoned choices within the relativism that exists in society'. Lahtinen and Pehkonen (2013: 397) report that according to their research, students' 'epistemological beliefs changed over a period of time from absolutism toward relativism and that *the pedagogical environment played an important role in this process*'.⁷ David Kember (2001: 217) even declares that 'critical and creative thinking is only possible if relativism is recognised'.

Deanna Kuhn later developed the idea of 'evaluativism' as the most developed epistemological position. In pointing to the possibility of evaluating knowledge in the light of reasons and evidence, this idea has similarities with the epistemological fallibilism defended in our argument. However, in Kuhn's model as well, relativism (what Kuhn has lately termed "multiplist") is seen as the second-best epistemological position, and the necessary level through which one can develop toward evaluativism (e.g. Kuhn, 2005; Kuhn and Weinstock, 2002; Kuhn et al., 2000; Hofer, 2006a; see also Hofer & Bendixen, 2012). According to Kuhn et al. (2000, 310):

In what we take to be a key event in the development of epistemological thought, the multiplist relocates the source of knowledge from the known object to the knowing subject, hence becoming aware of the uncertain, subjective nature of knowing. This awareness comes to assume such proportions, however, that it overpowers and obliterates any objective standard that could serve as a basis for comparison or evaluation of conflicting claims. Because claims are subjective opinions freely chosen by their holders and everyone has a right to their opinion, all opinions are equally right.

It seems obvious that most PE scholars are not familiar with the philosophical discussion of relativism. PE's literature neither presents philosophical arguments defending relativism nor refers to the arguments presented by philosophers of knowledge. This is surprising, particularly because the philosophical critiques of relativism are manifold.

Firstly, many philosophers have pointed out that absurd conclusions follow from the relativist idea of humans as constructing the facts (e.g. Boghossian, 2006: 38–39; Scheffler, 2000, 2001). From this position of *constructivism* to which many PE scholars (e.g. Hofer and Pintrich, 1997; King and Kitchener, 2004; Kuhn, 2005; Valanides and Angeli, 2005) subscribe, follows, for example, that the world approached by natural sciences can exist only when there are humans to perceive and conceptualize it. Israel Scheffler (1997: 199–200) characterizes the core of this philosophical problem as follows:

Now, whether a world answers to a version of our making is, in general, not up to us. Thus, if an "actual world" answers to a version of our making, we can hardly be supposed to have made it do so. Moreover, if a version of our making turns out to be true, it hardly follows that we have made its objects. Neither Pasteur nor his version of the germ theory made the bacteria he postulated, nor was Neptune created by Adams and Leverrier or by their prescient computations.

Secondly, a crucial philosophical question that relativists have difficulty answering is, as Boghossian (2006: 39) puts it, ‘the problem of disagreement’. Namely, within the relativist framework, no belief can be seen as incorrect. In Boghossian’s (2006: 39) words:

If a given fact really does owe its existence to our intentional activities, it is hard to see how there could fail to be *possible* circumstances in which we might have chosen to construct a different fact incompatible with it.

Thirdly, perhaps the most fundamental problem of relativism is that it is a self-refuting position. As Harvey Siegel (1987: 8–9) explains:

the relativist must appeal to non-relativist criteria, and assert relativism non-relativistically, in order to make the case for relativism. This is self-defeating for the relativist. But to fail to assert and defend relativism in this (non-relativistic) way is to fail to join the issue with the non-relativist who asserts that relativism is false (or incoherent). So the relativist can defend relativism only by rendering it incoherent. Conversely, to defend relativism relativistically is to fail to defend it at all. For if relativism is right, the very notion of rightness, and indeed that of rational defense, is given up, and so it cannot coherently be claimed that relativism is right or rationally defensible. In short: to defend relativism is to defend it non-relativistically, which is to give it up; to ‘defend’ it relativistically is not to *defend* it at all.

In a similar vein, Boghossian (2006: 56) writes that ‘either the formulation [the relativist] offers us does not succeed in expressing the view that there are only relative facts; or it consists in the claim that we should so reinterpret our utterances that they express infinitary propositions that we can neither express nor understand’.

If we now consider in more detail the different interpretations of ‘relativism’ among scholars of PE, it appears that all do not entail relativism in its self-refuting form. Some hold that relativism is a view which understands knowledge as ‘contingent and contextual’ (Hofer, 2000: 379; see also Briell et al., 2013: 482), whereas others see relativism as referring to the idea that ‘everyone has a right to his or her opinion, all opinions are equally right’ (Kuhn and Weinstock 2002: 123; see also Hofer, 2005). These interpretations of relativism differ so fundamentally from each other that some can be interpreted as not being (epistemologically) relativistic at all, whereas others cannot be interpreted otherwise.

Therefore it is important to distinguish between three positions all labelled relativistic in the context of PE: (1) knowledge is context-dependent in a weak sense, (2) knowledge is context-dependent in a strong sense, and (3) all beliefs are equally right. The first position states that particular human beliefs, statements and theories can be understood only in relation to some context, and cannot be directly compared, say, with the facts of independent reality. This position does not necessitate relativism, but actually fits better with epistemological fallibilism. With the second position, beliefs, statements and theories can be evaluated *only* in relation to some context, outside of which nothing can be said of their credibility and justifiability. This position is a version of (modest) relativism. Finally, the position that *all opinions are equally right* is, of course, a version of relativism in its ultimate form.

As mentioned above, the essential problem of this ultimate form of relativism is that one cannot be incorrect, because relativism admits no criteria for evaluating beliefs and theories. The same problem arises in contextual relativism once we become interested in justifying our beliefs outside a clearly defined context. Another problem of contextual relativism is the question of how we can define the contexts in which we are justified in saying that some belief is incorrect.

This problem is worth noting in relation to Kember's (2001: 217) aforementioned connection of relativism with the possibility of critical thinking.⁸ Along the lines of the previous argument, within the framework of epistemological relativism critical thinking is altogether pointless. If all beliefs and opinions are equally right, why should one think critically? In contrast, if Kember had said – along the lines of fallibilism — that all opinions, beliefs, and theories are fallible and should thus be submitted to critical thinking, this position would not cohere with relativism but rather with fallibilism.

Another problem following from relativism is that PE theory cannot effectively distinguish between the epistemological notions of objectivity and certainty. Indeed, in PE literature these notions are lumped together and connected with the naïve version of realism. According to Kuhn and Weinstock (2002: 123), 'someone at the absolutist (as well as the pre-absolutist realist) level sees knowledge in largely objective terms, as located in the external world and knowable with certainty'. Or, as Kuhn (2005: 30–31) describes the realist level of personal epistemology:

Beliefs are faithful copies of reality. They are received directly from the external world, rather than constructed by the knower. Hence, there are no inaccurate renderings of events, nor any possibility of conflicting beliefs, because everyone perceives the same external reality.

However, the possibility of objectivity implies neither the possibility of certainty nor the idea that our beliefs are direct copies of external reality. Contrary to the absolute nature of certainty, objectivity is best understood as a matter of degree. Our descriptions of reality can be more or less objective, depending on the adequate use of evidence and good reasons. At one end of the continuum are the merely subjective beliefs and at the other, the beliefs based on all relevant evidence and reasons (e.g. Holma, 2011: 536). The theories of science, for example, aim to reach the highest level of objectivity. But even a theory that had done so could never be assumed to be certain.

Relativism is an epistemological position not easy to defend. Were it not difficult in general, it would be untenable in the context of PE, because many of the aims and assumptions of PE are in contradiction with relativism. The endorsement of critical thinking as a learning aim, which is one of the main interests of PE (e.g. Kember, 2001; King and Kitchener, 2004; Kuhn, 2005, Lucas and Tan, 2013; Phan, 2008), is pointless within the relativist framework⁹. The learning aim of critical thinking is conceptually connected to the epistemological ideal of rationality (cf. Scheffler, 1973; Siegel, 1997). Rationality – as well as its development through teaching – requires the possibility of having some criteria for evaluating beliefs, conceptions and theories. Furthermore, epistemological relativism undermines the very possibility of teaching because if all beliefs and conceptions are equally valid, teachers have no criteria to assess students' understanding and develop teaching. Moreover, the idea of *research-based* teaching, to which PE research aims to contribute at both theoretical and practical levels, relies on the idea that there are (scientific) criteria for determining teaching methods that work, as opposed to other methods. If, in contrast, researchers' beliefs regarding teaching methods were only relative to their own subjective constructions, cultures, or other contexts, universities would not be justified in promoting or advancing research-based teaching.¹⁰

Fallibilism as an epistemologically justified alternative

One reason for the endorsement of relativism may be that PE theory does not involve the conception of epistemological fallibilism. Without fallibilism, PE theorists see the only alternative to relativism being some kind of naïve version of realism and epistemological foundationalism. This is to say that their interpretation of realism understands human beliefs as direct copies of reality (e.g. Kuhn, 2005: 30; Kuhn

and Weinstock, 2002: 124), and their interpretation of absolutism (which should rather be termed foundationalism) sees that humans can achieve certainty (e.g. Kuhn and Weinstock, 2002; Kuhn et al., 2000). One can agree that in comparison with these views of realism and absolutism, relativism may indeed seem a sophisticated epistemological position.

However, naïve realism and epistemological foundationalism are by no means the only alternatives to relativism. To the contrary, contemporary epistemology offers many routes for avoiding relativism without committing to either naïve realism or epistemological foundationalism. For example, although many contemporary philosophers defend various versions of realism (Niiniluoto, 1999), none of them accept that human beliefs are direct copies of reality, or that human beliefs could be certain. Realism, as such, states only that reality exists independently of humans. Realists may differ with respect to what part of reality they hold as existing independently of humans, and the extent to which they think that reliable knowledge can be acquired, but their assumption of the existence of independent reality makes them all philosophical realists. Realism implies neither the idea of the certainty of human knowledge nor the idea that human conceptions could directly reflect reality (e.g. Scheffler, 2000, 2001; see also Holma, 2004, 2009). Realists are usually committed to the idea that all knowledge is fallible.

Furthermore, Harvey Siegel (1987: 9–10) argues in his *Relativism Refuted* that an absolutist view of knowledge, in the sense that ‘claims to knowledge can be fairly, non-question-beggingly assessed’, does not imply that knowledge requires an indubitable foundation. In his discussion of Harold I. Brown’s defence of relativism, Siegel argues that Brown actually conflates relativism with fallibilism, and absolutism with foundationalism.

According to Siegel (1987: 9–10), the epistemological benefits Brown identifies with relativism are more suitable to fallibilism. For example, Brown’s statement ‘[t]he main thesis of relativist epistemology is that knowledge can be constructed on a fallible foundation. Relativism affirms my right to hold my own presuppositions in spite of their fallibility, to proceed on the basis of these presuppositions, and to reject competing presuppositions as false (Brown, 1977, 550)’ is, in Siegel’s view, not true of relativism but rather fallibilism. Within a relativist framework one actually cannot justifiably reject any competing presuppositions as false.

In our view, the theoretical framework of PE as well as its pedagogical recommendations would benefit by including fallibilism in its epistemological conceptions. Fallibilism preserves the benefits PE identifies with relativism without slipping into a self-refuting form of relativism or into conceptual problems in terms of objectivity.

Fallibilist¹¹ epistemology originates from Charles Sanders Peirce’s philosophy, in particular two articles (Peirce, 1934a, 1934b), ‘Some consequences of four incapacities’ and ‘Questions concerning certain faculties claimed for man’. Peirce formulated the concept of fallibilism to counter the two prevailing epistemological traditions of his day: rationalism and empiricism. He stated that both of these traditions fail in their assumptions regarding the possibility of certainty: rationalism in basing the possibility of certainty on reason, and empiricism in connecting certainty to perception. Peirce, who was impressed by Darwin’s groundbreaking theory, argued that due to the evolutionary origin of human knowledge there can be no certainty. Consequently, there are no fixed starting points from which we could derive infallible knowledge.

This line of thought did not, however, lead Peirce to skepticism regarding human knowledge. Instead, he argued that while certainty is not possible, there are good reasons for taking our current conceptions as a starting point for action and further inquiry. In Peirce’s view, the Cartesian concept of systematic doubt is self-deception, not something real human beings can achieve. We have to begin our thinking, doubting and criticizing from where we are. This position, like the belief that all human knowledge is uncertain, coheres with the evolutionary understanding of knowledge: the bodies of knowledge we now have may be mistaken, and are thus possibly subject to revision, but they have,

nevertheless, survived the process of evolution to this point; as such, they provide the best available starting point for how to proceed at the present moment with respect to further inquiry.

Fallibilism is thus different both from variants of relativism which claim that it is not possible to evaluate, compare, and improve our conceptions, and from variants of foundationalism, which claim that some sources of certainty or fixed starting points exist upon which to base our search for understanding. Fallibilism differs from relativism in not taking all beliefs, conceptions or theories as being either equally right or right merely in relation to some context, but seeks the criteria for evaluating, comparing and justifying our beliefs, theories and conceptions.

For PE, the recognition of fallibilism may have two different kinds of implications, some related to research and others to pedagogical recommendations. As we have argued, pedagogical recommendations cannot directly follow from empirical research due to the normative nature of pedagogy. Our argument also applies, of course, to the notion of fallibilism: to find fallibilist features in empirical data is one thing, to recommend fostering fallibilism through teaching is another.

At the level of empirical research, the research framework can be refined in a way that enables the identification of fallibilist features in students' epistemological positions (see also Hyytinen et al., 2014). The framework which identifies fallibilism can also expand researchers' understandings of individuals' epistemic development. At the level of pedagogical recommendations, fallibilism can be seen as a responsible epistemic position, because it admits to the uncertainty of knowledge but does not end up with the relativist conclusion that all beliefs are equally valid. A fallibilist view of knowledge, as the epistemic position held by many philosophers of science as the basis of all scientific activity, would be worth promoting in university studies. Fallibilism, by accepting the uncertainty of all human knowledge, can also be seen as a psychologically mature view of knowledge. As PE scholars King and Kitchener (2004: 9) themselves write, and in a clearly fallibilist spirit:

Reflective thinkers consistently and comfortably use evidence and reason in support of their judgements. They argue that knowledge claims must be understood in relation to the context in which they were generated, but that they can be evaluated for their coherence and consistency with available information. Because new data or new perspectives may emerge as knowledge is constructed and reconstructed, individuals using assumptions of reflective thinking remain open to reevaluating their conclusion and knowledge claims.

Conclusion

In this article we demonstrated the importance of an effective distinction between normative and descriptive dimensions of the theoretical framework used in the research area of personal epistemology. We particularly focused on the implicit normative assumptions within the theoretical framework of PE. Of special interest to us has been the problematic pedagogical recommendations that follow from such assumptions. Furthermore, we demonstrated how philosophical research could contribute to the normative dimensions of this theory, particularly by revealing some of the theory's conceptual confusion and contradictory assumptions in its current form. Finally, we introduced the notion of fallibilism as a way out. In our view, similarly with PE, other educationally oriented research would benefit from a dialogue between philosophical and empirical research.

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Notes

¹PE literature contains numerous synonyms for the term *personal epistemology*, such as *epistemic cognition*, *epistemic thinking*, *epistemological understanding*, *reflective judgement*, *epistemological beliefs*, *epistemological assumptions*, and *ways of knowing*. Harvey Siegel has recently criticized some of the current uses of the term ‘epistemology’ in science education, and has emphasized that “‘epistemology’ is the name of that branch of philosophy dedicated to the *theory of knowledge*’ (Siegel, 2014: 372).

² PE literature features several variants of the hierarchical models of personal epistemology (e.g. Baxter Magolda, 1992; Hofer and Pintrich, 1997; King and Kitchener, 1994, 2004; Kuhn, 1999, 2005; Perry, 1970). All of these models are similar in relation to the features discussed in this article (see also Hofer, 2002: 379).

³This of course does not imply that either of these research areas can provide any certain or final answers, but merely that they are devoted to approaching these particular questions and are thus likely to have the best available answers to their core questions.

⁴PE scholars also promote the idea of a *research-based* understanding of learning and teaching as a basis of higher education (Brew and Jewell, 2012; Brew, 2003; Stes et al, 2010). However, a small number of studies have explored how pedagogical practices affect the development of students’ conceptions. Moreover, there are no groundbreaking results showing relationships between teaching practices and students’ development (Lahtinen and Pehkonen, 2013; Lidar et al., 2004; Louca et al., 2004; Valanides and Angeli, 2005). Research has mostly concentrated on students’ conceptions as such (i.e. Briell et al., 2013; Brownlee, 2004; Kienhues et al., 2008; King and Kitchener, 2004; Kuhn and Weinstock, 2002; Rodríguez and Cano, 2006; Schommer-Aikins and Easter, 2006). Therefore, most *research-based* pedagogical recommendations are not based on research concerning the effectiveness of pedagogical interventions, but rather on researchers’ opinions concerning the best ways to support, enhance and improve the development found in empirical research concerning students’ learning processes.

⁵This assumption can be seen as quite reasonable in Deanne Kuhn’s model, which conceptualizes the progression of ways of thinking from early childhood to early adulthood. However, even though development in childhood can, in most cases, be interpreted as development from limited to more comprehensive understanding, this assumption can be genuinely distortive when applied to adult learners.

⁶The same dilemma is recognised in the research on students’ critical reflection (see Mälkki and Lindblom-Ylänne, 2012).

⁷Emphasis added.

⁸ On the promotion of critical thinking as a learning aim in the tradition of PE, see also King and Kitchener (2004), Kuhn (2005), Lucas and Tan (2013) and Phan (2008).

⁹ The problems of relativism in the educational context have been discussed, for example, by Kotzee (2010), Matthews (2000) and Phillips (1995).

¹⁰ Another, independent question is whether this aim is reasonable even if anti-relativism is accepted. One can be anti-relativist and either positive or sceptical about the possibility of research-based teaching. Our point is instead that this discussion is only possible among anti-relativists.

¹¹ This summary of Peirce's thinking is based on Holma's interpretation of the following works: Charles Sanders Peirce, *Pragmatism and Pragmaticism*, Cambridge, Massachusetts: Harvard University Press, 1934, Christopher Hookway, *Peirce*, 1985; Max H. Fisch, *Peirce, Semeiotic and Pragmatism*, Bloomington: Indiana University Press, 1986, and Israel Scheffler, *Four Pragmatists*, London: Routledge, 1974, see also Holma, 2012: 397–400.

References

Baxter Magolda M (1992) Students' epistemologies and academic experiences: implications for pedagogy. *Review of Higher Education* 15: 265–287.

Baxter Magolda M and Terenzini P (2004) Learning and teaching in the 21st century: Trends and implications for practice. American College Personnel Association.

Boghossian P (2006) *Fear of Knowledge: Against Relativism and Constructivism*. Oxford: Clarendon Press.

Bok D (2006) *Our Underachieving Colleges. A Candid Look at How Much Students Learn and Why They Should Be Learning More*. Princeton, NJ: Princeton University Press.

Briell JE, Elen J and Clarebout G (2013) Seeking convergent evidence of epistemological beliefs: A novel survey. *Electronic Journal of Research in Educational Psychology* 11(2): 473–500.

Brew A (2003) Teaching and Research: New relationships and their implications for inquiry-based teaching and learning in higher education. *Higher Education Research & Development* 22: 3–18.

Brew A and Jewell E (2012) Enhancing quality learning through experiences of research-based learning: Implications for academic development. *International Journal for Academic Development* 17: 47–58.

Brown H (1977) For a modest historicism. *The Monist* 60: 540–555.

Brownlee J (2004) Teacher education students' epistemological beliefs. Developing a relational model of teaching. *Research in Education* 72: 1–17.

Brownlee J, Walker S, Lennox S, Exley B and Pearce S (2009) The first year university experience: using personal epistemology to understand effective learning and teaching in higher education. *Higher Education* 58: 599–618.

- Buckland, LA (2010) Implications of philosophy for assessing epistemic cognition. ICLS '10 Proceedings of the 9th International Conference of the Learning Sciences - Volume 2, pp. 40–42.
- Chinn CA, Buckland LA and Samarapungavan A (2011) Expanding the dimensions of epistemic cognition: Arguments from philosophy and psychology. *Educational Psychologist* 46(3): 141–167.
- Fisch M (1986) *Peirce, Semeiotic and Pragmatism: Essays by Max H. Fisch*. Bloomington: Indiana University Press.
- Fisher A (2011) *Critical Thinking: an Introduction*. Cambridge: Cambridge University press.
- Greene JA, Azevedo R and Torney-Purta J (2008) Modeling epistemic and ontological cognition: Philosophical perspectives and methodological directions. *Educational Psychologist* 43(3): 142–160.
- Greene JA, Torney-Purta J and Azevedo R (2010) Empirical evidence regarding relations among a model of epistemic and ontological cognition, academic performance, and educational level. *Journal of Educational Psychology* 102(1): 234–255.
- Healey M (2005) Linking research and teaching to benefit student learning. *Journal of Geography in Higher Education* 29(2): 183–201.
- Hofer BK (2000) Dimensionality and disciplinary differences in personal epistemology. *Contemporary Educational Psychology* 25: 378–405.
- Hofer BK (2001) Personal epistemology research: Implications for learning and teaching. *Journal of Educational Psychology Review* 13(4): 353–383.
- Hofer BK (2002) Personal epistemology as a psychological and educational construct: An introduction. In Hofer BK and Pintrich PR (eds) *Personal epistemology: The Psychology of Beliefs about Knowledge and Knowing*. New Jersey: Lawrence Erlbaum Associates, pp.1–14.
- Hofer BK (2005) The Legacy and the challenges: Paul Pintrich's contributions to personal epistemology research. *Educational Psychologist* 40: 95–105.
- Hofer BK (2006a) Domain specificity of personal epistemology: Resolved questions, persistent issues, new models. *International Journal of Educational Research* 45: 85–95.
- Hofer BK (2006b) Beliefs about knowledge and knowing: Integrating domain specificity and domain generality: A response to Muis, Bendixen and Haerle (2006). *Educational Psychology Review* 18: 67–76.
- Hofer BK and Bendixen LD (2012) Personal Epistemology: Theory, research, and future directions. In Harris KR, Graham S, Urdan T, McCormick CB, Sinatra GM and Sweller J (eds) *APA Educational Psychology Handbook, Vol 1: Theories, Constructs, and Critical Issues*. Washington, DC, US: American Psychological Association, pp. 227–256.
- Hofer BK and Pintrich PR (1997) The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research* 67: 88–140.
- Hofer BK and Pintrich PR (2002) *Personal Epistemology: The Psychology of Beliefs about Knowledge and Knowing*. New Jersey: Lawrence Erlbaum Associates.

- Holma K (2004) Pluralism and education: Israel Scheffler's synthesis and its presumable educational implications. *Educational Theory* 54(4): 419–430.
- Holma K (2009) The strict analysis and the open discussion. *Journal of Philosophy of Education* 43(3): 325–338
- Holma K (2011) The epistemological conditions of moral education: The notions of rationality and objectivity revisited. *Educational Theory* 61(5): 533–548.
- Holma K (2012) Fallibilist pluralism and education for shared citizenship. *Educational theory* 62(4): 397–409.
- Hookway C (1985) *Peirce*. London: Routledge.
- Hyytinen H, Holma K, Toom A, Shavelson R and Lindblom-Ylänne S (2014) The complex relationships between critical thinking and epistemological beliefs in the context of problem solving. *Frontline Learning Research* 6: 1–25.
- Kaartinen-Koutaniemi M and Lindblom-Ylänne S (2012) Personal epistemology of university students: Individual profiles. *Education Research International*: 1–8.
- Kember D (2001) Beliefs about knowledge and the process of teaching and learning as a factor in adjusting to study in higher education. *Studies in Higher Education* 26(2): 205–221.
- Kienhues D, Bromme R and Stahl E (2008) Changing epistemological beliefs: The unexpected impact of a short-term intervention. *British Journal of Educational Psychology* 78: 545–565.
- King PM and Kitchener KS (1994) *Developing Reflective Judgment: Understanding and Promoting Intellectual Growth and Critical Thinking in Adolescents and Adults*. San Francisco: Jossey-Bass.
- King PM and Kitchener KS (2004) Reflective Judgment: Theory and research on the development of epistemic assumptions through adulthood. *Educational Psychologist* 39: 5–18.
- Kitchener RF (2011) Personal epistemology and philosophical epistemology: The view of a philosopher. In Elen J, Stahl E, Bromme R and Clarebout G (eds) *Links between Beliefs and Cognitive Flexibility: Lessons learned*. New York: Springer, pp.79–104.
- Kuhn D (1999) A developmental model of critical thinking. *Educational Researcher* 28: 16–25.
- Kuhn D (2005) *Education for Thinking*. MA: Harvard University Press.
- Kuhn D, Cheney R and Weinstock M (2000) The development of epistemological understanding. *Cognitive Development* 15: 309–328.
- Kuhn D and Weinstock M (2002) What is epistemological thinking and why does it matter? In Hofer BK and Pintrich PR (eds) *Personal epistemology: The psychology of Beliefs about Knowledge and Knowing*. New Jersey: Lawrence Erlbaum Associates, pp.121–144.
- Kotzee B (2010) Seven posers in the constructivist classroom. *London Review of Education* 8(2): 177–187.

- Lahtinen AM and Pehkonen L (2013) 'Seeing things in a new light': conditions for changes in the epistemological beliefs of university students. *Journal of Further and Higher Education* 37(3): 397–415.
- Lidar M, Lundqvist E and Östman L (2004) Teaching and learning in the science classroom. The interplay between teachers' epistemological moves and students' practical epistemology. *Science Education* 90: 148–163.
- Louca L, Elby A, Hammer D and Kagey T (2004) Epistemological resources: Applying a new epistemological framework to science instruction. *Educational Psychologist* 39(1): 57–68.
- Lucas U and Tan PL (2013) Developing a capacity to engage in critical reflection: students' 'ways of knowing' within an undergraduate business and accounting programme. *Studies in Higher Education* 38: 104–123.
- Matthews, MR (2000) Appraising constructivism in science and mathematics education. In DC Phillips (ed) *Constructivism in Education Opinions and second Opinions on Controversial Issues*. Chicago: University of Chicago Press, pp. 161–192.
- Moore WS (2002) Understanding learning in a postmodern world: reconsidering the Perry scheme of intellectual and ethical development. In Hofer BK and Pintrich PR (eds) *Personal epistemology: The Psychology of Beliefs about Knowledge and Knowing*. New Jersey: Lawrence Erlbaum Associates, pp.17–36.
- Muis KR (2004) Personal epistemology and mathematics: A critical review and synthesis of research. *Review of Educational Research* 74(3): 317–377.
- Muis KR, Bendixen LD and Haerle FC (2006) Domain-generality and domain-specificity in personal epistemology research: Philosophical and empirical reflections in development of a theoretical framework. *Educational Psychology Review* 18: 3–54.
- Murphy PK (2003) The philosophy in thee: Tracing philosophical influences in educational psychology. *Educational psychologist* 38(3): 137–145.
- Murphy PK, Alexander PA and Muis KR (2012) Knowledge and knowing: The journey from philosophy and psychology to human learning. In Harris KR, Graham S, Urdan T, McCormick CB, Sinatra GM and Sweller J (eds) *APA Educational Psychology Handbook, Vol 1: Theories, Constructs, and Critical Issues*. Washington, DC, US: American Psychological Association, pp.189–226.
- Mälkki K and Lindblom-Ylänne S (2012) From reflection to action? Barriers and bridges between higher education teachers' thoughts and actions. *Studies in Higher Education* 37(1): 33–50.
- Nieminen J, Lindblom-Ylänne S and Lonka K (2004) The development of study orientations and study success in students of pharmacy. *Instructional Science* 32: 387–417.
- Niiniluoto I (1999) *Critical Scientific Realism*. Oxford: Oxford University Press.
- Peirce CS (1934a) Some consequences of four incapacities. In Hartshorne C and Weiss P (eds) *Pragmatism and Pragmaticism, volume 5 of Collected Papers of Charles Sanders Peirce*, Cambridge, MA: Harvard University Press, pp. 156–189.

- Peirce CS (1934b) Questions concerning certain faculties claimed for man. In Hartshorne C and Weiss P (eds) *Pragmatism and Pragmaticism, volume 5 of Collected Papers of Charles Sanders Peirce*, Cambridge, MA: Harvard University Press, pp. 135–155.
- Perry WG (1970) *Forms of Intellectual and Ethical Development in the College Years*. New York: Holt, Rinehart, and Winston.
- Phan HP (2008) Predicting change in epistemological beliefs, reflective thinking and learning styles: a longitudinal study. *British Journal of Educational Psychology* 78: 75–93.
- Phillips DC (1995) The good, the bad and the ugly: The many faces of constructivism. *Educational Researchers* 24: 5–12.
- Pintrich PR (2002) Future challenges and directions for theory and research on personal epistemology. In Hofer BK and Pintrich PR (eds) *Personal Epistemology: The Psychology of Beliefs about Knowledge and Knowing*. New Jersey: Lawrence Erlbaum Associates, pp.389–414.
- Popper KR (1972) *Objective Knowledge: An Evolutionary Approach*. London: Clarendon Press.
- Rodríguez L and Cano F (2006) The epistemological beliefs, learning approaches and study orchestrations of university students. *Studies in Higher Education* 31(5): 617–636.
- Schommer-Aikins M (2002) An evolving theoretical framework for an epistemological belief system. In Hofer BK and Pintrich PR (eds) *Personal Epistemology: The Psychology of Beliefs about Knowledge and Knowing*. New Jersey: Lawrence Erlbaum Associates, pp.103–118.
- Schommer-Aikins M and Easter M (2006) Ways of Knowing and Epistemological Beliefs: Combined effect on academic performance. *Educational Psychology* 26: 411–423.
- Scheffler I (1973) *Reason and Teaching*. London: Routledge & Kegan Paul.
- Scheffler I (1974) *Four Pragmatists: A Critical Introduction to Peirce, James, Mead, and Dewey*. London: Routledge & Kegan Paul.
- Scheffler I (1997) *Symbolic Worlds: Art, Science, Language, and Ritual*. New York: Cambridge University Press.
- Scheffler I (2000) A plea for plurealism. *Erkenntnis* 52(2): 161–173.
- Scheffler I (2001) My quarrels with Nelson Goodman. *Philosophy and Phenomenological Research* 62(3): 665–677.
- Siegel H (1987) *Relativism Refuted: A Critique of Contemporary Epistemological Relativism*. Dordrecht: D. Reidel.
- Siegel H (1997) *Rationality Redeemed: Further Dialogues on an Educational Ideal*. New York: Routledge.
- Siegel H (2014) What's in a name?: Epistemology, “epistemology,” and science education. *Science Education* 98(3): 372–374.

Southerland SA, Sinatra GM and Matthews MR (2001). Belief, knowledge, and science education. *Educational Psychology Review* 13: 325–351.

Stes A, Min-Leliveld M, Gijbels D, and Van Petegem P (2010) The impact of instructional development in higher education: The state-of-the-art of the research. *Educational Research Review* 5: 25–49.

Valanides N and Angeli C (2005) Effects of instruction on changes in epistemological beliefs. *Contemporary Educational Psychology* 30: 314–330.

West EJ (2004) Perry's legacy: Models of epistemological development. *Journal of Adult Development* 11: 61–70.